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24 May 2022

Sea Level Rise Commission
Town of St. Michaels
300 Mill Street
St. Michaels, MD 21663

Dear Sea Level Rise Commission,

Executive Summary

In the prior feasibility study and analysis of the Mill St Road Reconstruction on behalf of the TOSM-SLR Commission, Rauch inc. concluded that raising Mill St., installing a brick sidewalk on the north side, re-installing a new culvert with tide gate was possible and recommended. However, what was not known at the time, was the effect of a working tide gate and its impact on the upstream watershed during high intensity rain events. In particular, if the road and tide gate effectively kept out tidal waters, would backed-up stormwater from a 39.6-acre drainage area be held in the existing drainage ditch on the Maritime Museum's property or would it spill over the banks and create new flooding problems? Therefore, Rauch recommended further Hydraulic & Hydrologic (H&H) modeling to answer that question.

Rauch inc. can confirm that a closed, working tide gate will create more extensive flooding in the upstream watershed during a storm event than tide induced flooding that is currently experienced. Both the existing drainage ditch area and a conceptually enlarged drainage ditch cannot temporarily store the peak flood volumes required for even the 2-year frequency storm event. Therefore, Rauch recommends an open box culvert instead of a tide gate for Mill St. when the road is renovated.

Results & Methodology

The results of the H&H modeling revealed that the peak flood levels overflowed the current storage capacity of the existing drainage ditch areas, labeled as Pond 1 (closest to Mill St) and Pond 2 (upstream end separated by gravel access road). Rauch created conceptual ponds in CAD software to the maximum feasible limit both in area and depth for Ponds 1 and 2. Pond 1 could store 35,000 ft^3 and Pond 2 could store 119,235 ft^3, for a combined storage capacity of 154,235 ft^3.

The following results of the H&H modeling are shown below with corresponding storm events to their peak flood elevations, translated to storage volume needed, and the percentage that the combined proposed pond volumes could hold during each of these storm events.

- 100-year storm = Peak Flood Elevation: 7.29' = 1,058,942 ft^3 of storage needed | Proposed ponds could store 14.56% of calculated runoff
- 10-year storm = Peak Flood Elevation: 5.11' = 533,382 ft^3 of storage needed | Proposed ponds could store 28.9% of calculated runoff
- 5-year storm = Peak Flood Elevation: 4.79' = 416,929 ft^3 of storage needed | Proposed ponds could store 37% of calculated runoff
- 2-year storm = Peak Flood Elevation: 4.47' = 287,298 ft^3 of storage needed | Proposed ponds could store 53.7% of calculated runoff

In comparison to the *Harbor and Stormwater Infrastructure Study* by GMB, the Sea Level Rise (SLR) forecast projections have substantially lower tide and storm surge elevations compared to the peak flood elevations for runoff, as seen in the re-created tide forecast table below:

Depicted Event	SLR	Tide	Surge	Top Elev
50% SLR projection	1.3'	1.02'	-	2.32'
1% SLR projection	2.4'	1.02'	-	3.42'
Elevation 4.0	1.7'	1.02'	1.28'	4.0'
FEMA Elevation 6.0	-	-	6.0'	6.0'

Recommendations

In summary, because of the further H&H modeling analysis, Rauch recommends abandoning the use of a tide gate at the Mill St outfall location and use a larger open culvert system instead when renovating the road. There is not enough usable open space nor depth for creating an adequately sized stormwater detention facility to hold temporarily backed-up stormwater upstream of Mill St. There is available land left to expand the proposed ponds in other directions in the immediate vicinity. However, expanding the ponds even further cuts too deeply into prime real estate areas, other properties, quality forested areas, and remaining Maritime Museum working storage space; therefore, the proposed ponds are considered to be pushed to their maximum feasibility and realistic limits. Rauch mentions these options as a last resort if the detention capacity is still required.

Although the flooding impact would be less by not backing up the stormwater, the problem remains of partial inundation for some buildings of the Maritime Museum. Additional Stormwater Management strategies should be deployed for the rest of the Town. Strategies include conservation landscaping, reducing turf, increasing urban tree canopy, rainwater harvesting with rain barrels, and rain gardens (please see the GMB report on additional recommendations). Additional coastal flood management strategies include "Managed Realignment", where you design coastal areas to embrace flooding by strategically re-directing flood waters to presently defended areas.

Please feel free to reach out to me with further questions.

Sincerely,

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May 4th, 2023
Mill St. Road Reconstruction, St. Michael's, MD
Flood Tide Predictions to Mill St Tide Gate

Mill St. Road Reconstruction, St. Michael's, MD
Potential Detention Ponds to Mill St Tide Gate

May 4th, 2022
Mill St. Road Reconstruction, St. Michael's, MD
Peak Flood Elevations from Rainfall with Mill St Tide Gate